VI. *Remarks on* Stones *of a regular Figure found near* Bagneres *in* Gaſcony: *With other Obſervations, communicated by Monſieur* Secondat de Monteſquieu, *of the Academy of Sciences of* Bordeaux, *in a Letter to* Martin Folkes, *Eſq; Pr. R. S.*

Read Mar. 8. 1743-4.

THOUGH the Spring called *La Fontaine du Salût* is at a good Diſtance from the Town of *Bagneres*, it is, nevertheleſs, as much frequented as any in that Country; and, beſides its admirable Effects in curing a great Number of Diſtempers, it likewiſe offers, to the Eyes of the Lovers of Natural Hiſtory, a very remarkable Singularity.

In the firſt Bath, through which the largeſt of the Two Branches of the Spring flows, there are found, from time to time, ſmall Stones, of the Colour of Iron-ruſt, and of a regular Figure; being either Parallelopipedes with oblique Angles, of which the Sides are unequal; or ſmall ſolid Bodies with Six Sides, only differing from Cubes or Dice in this, that the Surfaces are not perfectly perpendicular one to another, but a little inclined; as alſo commonly longer than they are broad, and broader than they are high.

The largeſt which I have ſeen were but 11 Lines in Length, 9½ in Breadth, and 6 in Height: They are moſtly a great deal ſmaller. I have one which is very odd, being a Parcel of an hundred in one Lump.

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Lump. There are ſome on which one may obſerve ſhining *Striæ*, that ſeem to be of a metallic Subſtance.

I have heard, that a great many Stones like theſe are alſo found on the Sides of a Brook in *Spain*; from whence, without Doubt, they got the Name they are commonly called by, of *Ferreles d'Eſpagne*.

About Two Months ago, happening to take a Walk in the Road newly made between *Bagneres* and the *Fontaine de Salût*, I perceived, that, in digging the Ditch on the Side of the Road, the Workmen had laid open a Rock of a Sort of imperfect Slate, but ſofter, and of a lighter Colour, than Slate commonly is. The Rock itſelf is compoſed of Layers or Beds lying almoſt parallel one over the other: The Subſtance of the Slate ſeems to be a Compoſition of Fibres or Strings, placed on the Sides of each other, and equally inclined to their Beds or Layers; whence it comes, that, upon breaking them with a Hammer, the Pieces, ſometimes, are pretty like the Figure of a regular Parallelopipede with oblique Angles.

Upon a narrower Examination of this Sort of Slate, I found a great Number of Parallelopipede Stones, like thoſe before ſpoken of, only ſmaller: I have ſeen them of all Sizes, from thoſe in which the largeſt Side is but of Two or Three Lines. I obſerved alſo, after having broken to pieces ſeveral little Bits of Slate, certain black Spots; which, by the Help of a Microſcope, I found to be real figured Stones.

Beſides this, I took notice, that every one of theſe Stones, as long as it remains in the Rock, is always found between Two Bundles or Cluſters of tranſparent Fibres, of which, generally, one is placed on the one, and the other on the oppoſite Side. Theſe Bundles are larger in great Stones: Thoſe which ſeem, to the naked Eye, to be but ſmall black Spots, are, nevertheleſs, accompanied by their Bundles.

I have ſome of theſe Stones, where the tranſparent Fibres, of which every Bundle is compoſed, had left a Vacancy in the Middle of their *Axes*: This ſort of Conduit being coloured with a Matter of a ruſty Colour, one finds likewiſe, ſometimes, between the Fibres a little of this ruſty-coloured Matter; and now-and then metallic and ſhining Veins. One might ſay, that the Uſe of theſe tranſparent Fibres is the ſame as of Strainers; which (let the Matter be of a metallic Nature or not) ſuffer nothing to paſs thro' them to the little Stones, but ſuch Particles as are proper to advance their Growth, and ſo to ſerve them as it were for Roots. In Bits of imperfect Slate, tho' harder, and of a bluer Colour, than the Sort I before mentioned, are found ſmall Stones, of a like Figure, but different in this, that they are of a fine and ſhining braſs Colour. They are, as well as the others, accompanied by tranſparent Lumps.

One meets likewiſe with large Stones of the Colour of iron Ruſt in ſeveral Rocks thereabout. It is probable, that the *Fontaine de Salût* paſſes thro' one like that I have deſcribed; and, if it meets with any of theſe figured Stones in the Sides of the Conduits thro' which it paſſes, it eaſily looſens them, and carries them along with it. The Bundles of tranſparent Fibres ſtick pretty faſt to the Slate or Rock, but are ſlightly faſtened to the little Stone, from which they are very eaſily ſeparated. Hence it comes, that all thoſe which fall into the Bath, or

Fontaine de Salût, are got thither without their Bundles.

The Formation of theſe Stones deſerves to be examined: If it was carefully ſtudied, it might, perhaps, give Light to the Formation of other figured Stones. It even ſeems, that, by beginning with this Figure, which is the moſt ſimple that one can imagine, one may the rather hope for Succeſs in the like Inquiry.

This Parallelopipede Figure with oblique Angles is common to many Stones in the Country of *Bagneres*, and the neighbouring Mountains. Several Cryſtallizations of the Grotto of *Campan* break into Fragments of this Figure: Thoſe which hang down from the Top of the Vault of that Grotto, are, originally, ſmall hollow Pipes, formed by the Water which trickles down Drop by Drop; and whoſe outer Surface, fixing themſelves by their ſmall Baſes, forms, by degrees, a ſort of blunted Pyramids, which, like ſo many Rays from the Axis, which is nothing but the hollow Pipe, become ſolid at laſt. This Axis ſeems compoſed of Plates, almoſt cylindrical, laid one over another; but, if broken, the Whole divides into Fragments of a Parallelopipede Figure. The blunted Pyramids, that are about the Axis, divide themſelves at firſt into other blunted Pyramids; but, afterwards, almoſt all theſe Fragments divide of themſelves into other Fragments of a Parallelopipede Figure.

The Stone of the Mountain of *Barege*, upon which the *Asbeſtos* grows, breaks alſo conſtantly into Fragments of the ſame Figure.

I have likewiſe preſerved a Bit of Rock half tranſparent, the Fragments of which are like the others.

Having

Having ſeen ſeveral Productions of Nature, in which one diſcovers, that the Figure I have been ſpeaking of ſo remarkably prevails, I was nevertheleſs ſurpriſed, when I found the ſame Figure in the Sediment of the Water of the *Fontaine de Salút*.

I had let a conſiderable Quantity of the Water of the mineral Spring evaporate; there remained a ſhineing Duſt, in which I could diſtinguiſh nothing. I then looked at it through a Microſcope; and, among ſeveral Cryſtals of a leſs regular Figure, I found many which were quite regular and well-ſhaped, with Six Faces, and oblique Angles. Several Perſons, who have, at different times, been Eye-witneſſes of this Sight, have been well ſatisfied with it.

The Waters of this Spring contain no Iron, as it is commonly believed. When you put the Tincture of Galls in it, it grows neither black nor red: This Mixture only turns it a little, and makes it look whitiſh, after having ſtood ſome Hours.

When theſe Waters are evaporated by a mild and equal Heat, the ſmall Cryſtals are found ſwimming on the Surface; where they join, and form a Film upon the Water; ſome of which ſticks alſo to the Sides and the Bottoms of the Veſſel. Thoſe Cryſtals which are formed firſt, are inſipid; but thoſe which are produced towards the End of the Evaporation, are, indeed, of the ſame Shape, but of a tart and ſaltiſh Taſte. There remains yet a little of this Matter, which cannot be reduced to very regular Cryſtals: It is of a very ſharp and pungent Savour, but has nothing of the prevailing Character of Acid or Alkali; at leaſt, it makes no ſenſible Impreſſion upon blue Paper.

The Waters of the Spring *du Pied* have the ſame Quality as thoſe of the *Salût*: They produce the ſame Effect when mixed with Galls; yield Cryſtals exactly of the ſame Figure, but in yet greater Quantity.

I have not made the ſame Experiments with the other Springs at *Bagneres*; but, it is probable, they do not differ from the former, except as to More or Leſs.

To conclude theſe Obſervations; I have alſo found, at *Bagneres*, a particular aquatic Plant, which I had ſeen, for the firſt time, in the great Baſon of the boiling Spring at *Dax*: It bears neither Fruit nor Flower, as far as appears; its Subſtance is intirely compoſed of ſmall Bladders full of Air; the Surface of it is like Net-work or Canvas; it grows only in the hotteſt mineral Springs; it may be found at the Spring, called, *de la Reine*, at the *Bath des Pauvres*, and at the *New Spring*; but moſt plentifully at that Place where Part of the *Spring de la Reine* iſſues out of a Rock near the *Capuchins*. Nobody, as far as I know, has ever ſpoken of this Plant, before I gave an Account of it Two Years ago, at the public Reſumption of our Academical Meetings. The Vegetation, and particular Qualities of it, may, perhaps, deſerve to be more narrowly examined; and I believe it may be properly called, *Fucus thermalis veſicularis, Superficie reticulari.*

However different the preceding Subject of my Diſcourſe may be from what I am next going to ſpeak of; I beg Leave to ſet down One Obſervation more, which I have made on the *Pie du Midy*, and of which the Reſult may prove curious.

It is well known, that the greateſt Degree of Heat in common Water is that which it acquires by boiling; that is to ſay, if Water is put upon the Fire, it grows by degrees hotter and hotter, till it quite boils; but, after that, though there be never ſo much Fire added, and it ſtand never ſo long upon it, it will never grow hotter than it was on the firſt Inſtant, when it began to boil. Hence the Degree of Heat of boiling Water is looked upon as fixed and invariable.

Fahrenheit, that ingenious Maſter in Mechanics, ſo well known by his Mercurial Thermometers, is the firſt who has remarked the contrary. He obſerved, that the Heat of boiling Water was greater when the Air was heavy (that is to ſay, when the Mercury ſtood higher in the Barometer); and, on the contrary, the Heat was leſs when the Air was lighter.

Mr. *Le Monnier* the younger, who has obliged us with a Tranſlation of Mr. *Cote*'s Lectures in Natural Philoſophy, with excellent Notes upon the ſaid Work, has put *Fahrenheit*'s Diſcovery paſt all Doubt, and has very much improved it.

On the 6th of *October* 1739, being provided with a Barometer, and a Mercurial Thermometer of M. *Deliſle*, he climbed up to the higheſt Top of the *Canigou*, a Mountain in *Rouſſillon*, which paſſes for the higheſt among the *Pyrenees:* There he found his Barometer to ſtand at 20 Inches 2½ Lines; whilſt at *Perpignan* it ſtood at 28 Inches 2 Lines. The Difference between the Heat of the Water which he boiled there, and that which he boiled at *Perpignan*, was 15 Degrees of his Thermometer.

The ſame Thermometer being ſurrounded with Snow, the Mercury fell down to the ſame Degree as pounded Ice had made it do at *Paris*.

Hence he concludes, that the Heavineſs of the Air has a ſenſible Influence on boiling Water; but that it in no way alters the Term of Congelation.

All theſe Particulars may be ſeen, *p.* 408. of *Cote's* Experimental Lectures; and in the Memoirs of the Academy of Sciences of *Paris*, *Anno* 1740.

This is the ſame Experiment which I have repeated on the Top of the *Pic du Midy*; thinking that ſo ſingular a Fact ought to be obſerved more than once.

I carried Two Barometers, the Tubes of which the Reverend Father *Francis* had been ſo good as to fill for me with great Care. I had likewiſe with me Two Mercurial Thermometers, upon which I ſet the Degrees at *Bagneres*: I took the fixed Terms of the Graduation; that is to ſay, that of Congelation, and that of boiling Water, afterwards putting nought to the Term of Congelation. I marked 180° Difference between this Term and that of boiling Water.

Being come to the higheſt Top of the *Pic du Midy* on the 9th of laſt *July*, the Mercury roſe in one of my Barometers to 20 Inches 2 Lines; and in the other, to 20 Inches $1\frac{1}{2}$ Line. I ſurrounded my Thermometer with Snow, and the Mercury fell exactly to the ſame Degree as the Snow had made it fall to at *Bagneres*. Afterwards I plunged it into boiling Water; whereupon the Mercury roſe to 165° of my Graduation: So that the Difference between the Heat of boiling Water on *Pic du Midy*, and that at *Bagneres*, conſiſted of 15°.

At my Return to *Bordeaux*, I obſerved, that I had marked the Term of boiling Water at *Bagneres* leſs high by $3\frac{1}{2}$, than at the Term of boiling Water at *Bordeaux*, taken at the time when the Barometer was at 28 Inches 2 or 3 Lines: Therefore having anew graduated my Thermometer the 165th, the Degree of the former Graduation fell now upon the 162d; ſo that the complete Difference between the Term of boiling Water on the Top of the *Pic du Midy*, and that of the ſame at *Bordeaux*, the Barometer being at 20 Inches 3 Lines, amounts to 18 Degrees on the Thermometer of *Fahrenheit*.

Now the Conformity between the Obſervation made by M. *Le Monnier*, and this Repetition of the ſame Obſervation, can hardly be greater; ſeeing the Heights of the Barometers are almoſt the ſame; and the 15 Degrees of Difference, found by M. *Le Monnier* on *De Liſle's* Thermometer, amount preciſely to 18 Degrees on the Thermometer of *Fahrenheit*, which I made uſe of.